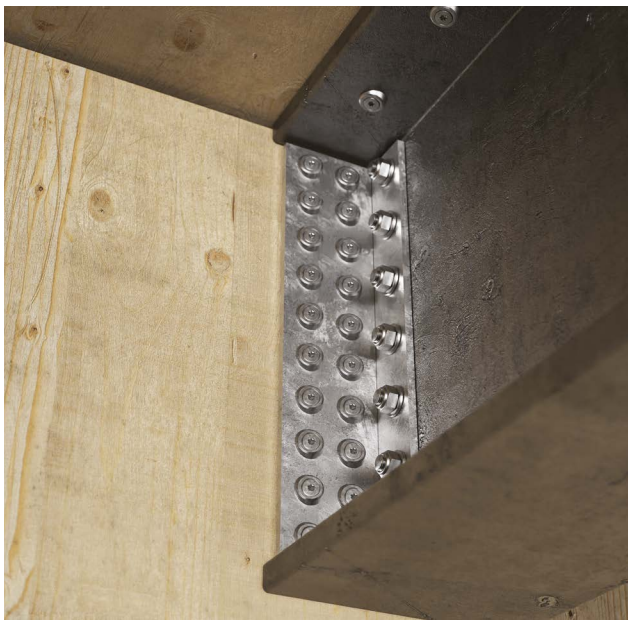
HUS

TURNED WASHER

ELC-4645 ESR-4645 UKTA-0836 22/6195 ETA-11/0030



COMPATIBILITY
It is the ideal coupling for countersunk screws (HBS, VGS, SBS-SPP, SCI, etc.) when the axial strength of the connection is to be increased.

TIMBER-TO-METAL
It is the optimal choice for connections on metal plates with cylindrical holes.

HUS EVO
The HUS EVO version increases the washer's corrosion resistance due to the special surface treatment. This allows it to be used in service class 3 and atmospheric corrosion class C4.

HUS 15°
The 15° angled washer is specifically designed for particular timber-to-metal applications where just a small angle is needed for screw insertion. The HUS BAND double-sided adhesive tape holds the washer in place during overhead applications.

MY PROJECT SOFTWARE

HUS

HUS 15°

HUS EVO

HUS A4

MATERIAL

HUS 15°

alu — aluminium alloy EN AW 6082-T6 — SC3 C2 T3

HUS

Zn ELECTRO PLATED — electrogalvanized carbon steel — SC2 C2 T2

HUS EVO

C4 EVO COATING — carbon steel with C4 EVO coating — SC3 C4 T3

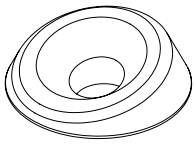
HUS A4

A4 AISI 316 — A4 | AISI316 austenitic stainless steel — SC4 C5 T5

FIELDS OF USE

- thin, thick metal plates with cylindrical holes
- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods

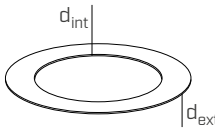
CODES AND DIMENSIONS



alu

HUS 15° - 15° angled washer

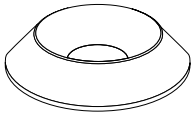
CODE	d_{HBS} [mm]	d_{VGS} [mm]	pcs
HUS815	8	9	50



HUS BAND - double-sided adhesive for HUS washers

CODE	d_{int} [mm]	d_{ext} [mm]	pcs
HUSBAND	22	30	50

Compatible with HUS815, HUS10, HUS12, HUS10A4.



Zn ELECTRO PLATED

HUS - turned washer

CODE	d_{HBS} [mm]	d_{VGS} [mm]	pcs
HUS6	6	-	100
HUS8	8	9	50
HUS10	10	11	50
HUS12	12	13	25

C4 EVO COATING

HUS EVO - turned washer

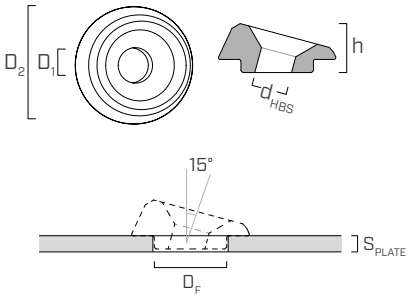
CODE	$d_{HBS\ EVO}$ [mm]	$d_{VGS\ EVO}$ [mm]	pcs
HUSEVO6	6	-	100
HUSEVO8	8	9	50

A4 AISI 316

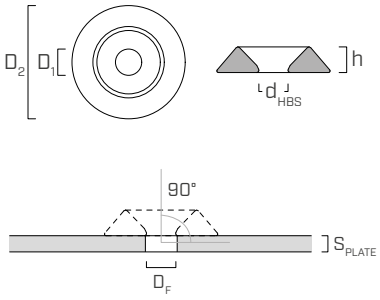
HUS A4 - turned washer

CODE	d_{SCI} [mm]	$d_{VGS\ A4}$ [mm]	pcs
HUS6A4	6	-	100
HUS8A4	8	9	100
HUS10A4	-	11	50

GEOMETRY AND MECHANICAL CHARACTERISTICS



HUS 15°



HUS - HUS EVO - HUS A4

GEOMETRY

Washer			HUS815	HUS6 HUSEVO6 HUS6A4	HUS8 HUSEVO8 HUS8A4	HUS10 HUS10A4	HUS12
Internal diameter	D_1	[mm]	9,50	7,50	8,50	10,80	14,00
External diameter	D_2	[mm]	31,40	20,00	25,00	30,00	37,00
Height	h	[mm]	13,60	4,50	5,50	6,50	8,50
Plate hole diameter (1)	D_F	[mm]	20÷22	6,5÷8,0	8,5÷10,0	10,5÷12,0	12,5÷14,0
Steel plate thickness	S_{PLATE}	[mm]	4÷18	-	-	-	-

(1)The choice of diameter is also linked to the diameter of the screw used.

CHARACTERISTIC MECHANICAL PARAMETERS

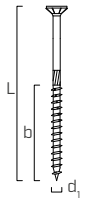
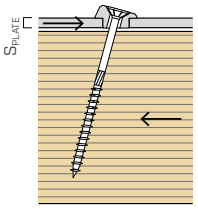
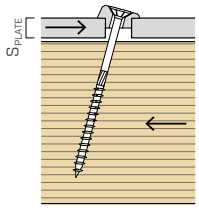
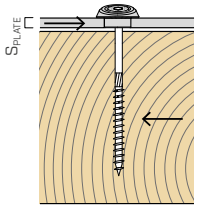
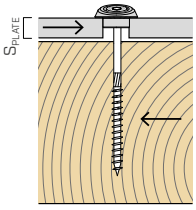
			softwood *(softwood)*
Head-pull-through parameter	$f_{head,k}$	[N/mm²]	10,5
Associated density	ρ_a	[kg/m³]	350
Calculation density	ρ_k	*[kg/m³]*	*≤ 440*

For applications with different materials or with high density please see ETA-11/0030.

STRUCTURAL VALUES | TIMBER

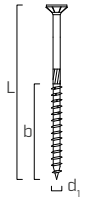
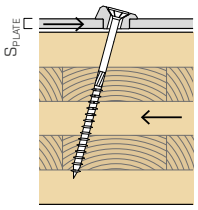
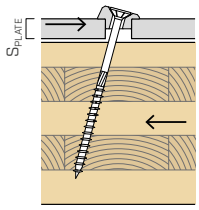
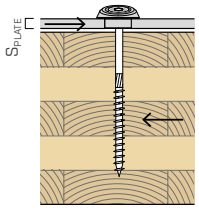
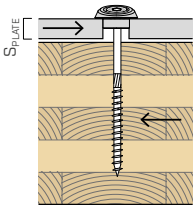
CHARACTERISTIC VALUES
EN 1995:2014

HUS 15°

geometry				SHEAR							
				steel-to-timber thin plate		steel-to-timber thick plate		steel-to-timber thin plate		steel-to-timber thick plate	
											
	$d_{1,HBS}$ [mm]	L [mm]	b [mm]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]
HUS 15°	8	80	52	4	3,61	8	4,93	4	3,74	8	5,11
		100	52		3,86		4,93		4,00		5,11
		120÷140	60		4,05		5,13		4,20		5,31
		160÷280	80		4,54		5,62		4,70		5,81
		≥ 300	100		5,03		6,10		5,21		6,32

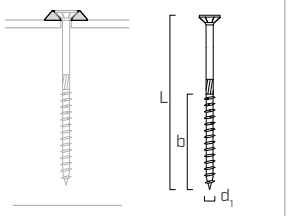
STRUCTURAL VALUES | CLT

HUS 15°

geometry				SHEAR							
				steel-CLT thin plate		steel-CLT thick plate		steel-CLT thin plate		steel-CLT thick plate	
											
	$d_{1,HBS}$ [mm]	L [mm]	b [mm]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]
HUS 15°	8	80	52	4	3,28	8	4,67	4	3,40	8	4,83
		100	52		3,65		4,67		3,77		4,83
		120÷140	60		3,83		4,85		3,96		5,02
		160÷280	80		4,28		5,30		4,43		5,49
		≥ 300	100		4,73		5,75		4,90		5,96

NOTES and GENERAL PRINCIPLES on page 71.

HUS/HUS EVO

				SHEAR								TENSION
geometry				timber-to-timber ε=90°		timber-to-timber ε=0°		steel-to-timber thin plate		steel-to-timber thick plate		head pull-through with washer
												
	$d_{1,HBS}$ [mm]	L [mm]	b [mm]	A [mm]	$R_{V,90,k}$ [kN]	A [mm]	$R_{V,0,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	$R_{head,k}$ [kN]
HUS HUS-EVO	6	80	40	35	2,38	35	1,20	3	2,43	6	3,12	4,53
		90	50	35	2,57	35	1,38		2,61		3,31	4,53
		100	50	45	2,61	45	1,38		2,61		3,31	4,53
		110÷130	60	45÷65	2,80	45÷65	1,58		2,80		3,49	4,53
		≥ 140	75	≥ 60	2,80	≥ 60	1,69		3,09		3,78	4,53
HUS HUS-EVO	8	80	52	22	2,98	22	1,58	4	3,79	8	5,11	7,08
		100	52	42	3,78	42	1,95		4,00		5,11	7,08
		120÷140	60	54÷74	4,20	54÷74	2,13		4,20		5,31	7,08
		160÷280	80	74÷194	4,45	74÷194	2,61		4,70		5,81	7,08
		≥ 300	100	≥ 194	4,45	≥ 194	2,79		5,21		6,32	7,08
HUS	10	80	52	21	3,32	21	1,86	5	4,30	10	6,55	10,20
		100	52	41	4,73	41	2,41		5,51		7,12	10,20
		120	60	53	5,50	53	2,75		5,76		7,37	10,20
		140	60	73	5,76	73	2,75		5,76		7,37	10,20
		160÷280	80	73÷193	6,40	73÷193	3,28		6,40		8,00	10,20
		≥ 300	100	≥ 193	6,42	≥ 193	3,87		7,03		8,63	10,20
HUS	12	120	80	31	5,57	31	3,27	6	7,55	12	9,79	15,51
		160÷280	80	71÷191	7,81	71÷191	3,88		7,81		9,79	15,51
		≥ 320	120	≥ 191	8,66	≥ 191	4,98		9,32		11,30	15,51

ε = screw-to-grain angle

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- Design values can be obtained from characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

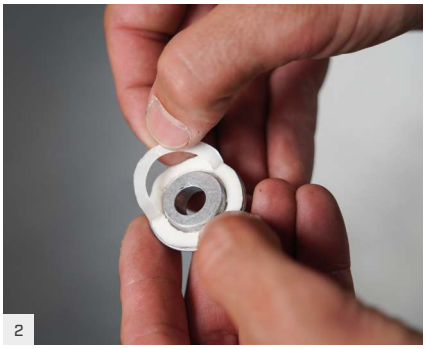
  The coefficients γ_M and k_{mod} should be taken according to the current regulations used for the calculation.
- For the mechanical strength values and the geometry of the screws and washers, reference was made to ETA-11/0030.
- Sizing and verification of the timber elements and metal plates must be done separately.
- The values in the table are independent of the load-to-grain angle.
- The screws must be positioned in accordance with the minimum distances.
- The characteristic shear resistances are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.
- Shear strengths were calculated considering the threaded part fully inserted in the second element.
- The characteristic strength to head pull-through with washer was calculated using timber elements.
  In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or pull-through.
- For different calculation configurations, the MyProject software is available (www.rothoblaas.com).

NOTES

- The characteristic steel-timber shear strengths were evaluated by considering the bearing plane of the washer parallel to the grains.
- The characteristic plate shear strengths are evaluated considering the case of thin plate (S_{PLATE} = 0.5 d_1) and thick plate (S_{PLATE} = d_1) .
- A density of ρ_k = 385 kg/m^3 for the timber elements and ρ_k = 350 kg/m^3 for the CLT elements was considered during the calculation.
  For different ρ_k values, the strength values in the table can be converted by the k_{dens} coefficient (see page 34).
- The characteristic values on CLT are according to the national specifications ÖNORM EN 1995 - Annex K.
- The characteristic shear strength is independent from the direction of the grain of the CLT panels outer layer.
- The characteristic shear and pull-through strength of the head with HUS on CLT can be found on page 39.
- For available HBS and HBS EVO screw sizes and structural values see pages 30 and 52.
- Characteristic strengths for HUS A4 can be found on page 323.

HUS 15° INSTALLATION

Drill a D_F = 20 mm diameter hole in the metal plate at the insertion point of the HUS815 washer.



We recommend applying HUSBAND adhesive underneath the HUS815 washer to facilitate application.

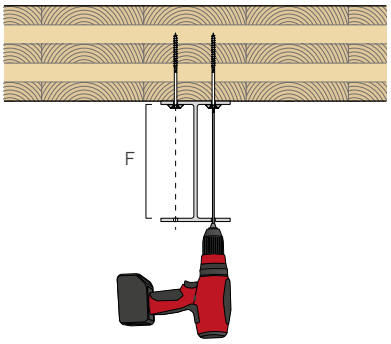
Remove the liner and apply the washer at the hole, paying attention to the insertion direction.

Drill a guide hole with a diameter of 5 mm and a minimum length of 20 mm, preferably using the JIGVGU945 template to ensure the correct installation direction.

Install the HBS screw of the desired length. Do not use pulse screw guns.
Pay attention when tightening the connection.

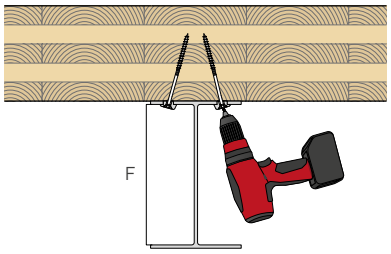
Installation completed.
The 15° screw angle ensures that the distance to the head of the panel (or beam) is maintained.

STEEL-TIMBER INSTALLATION FROM BELOW



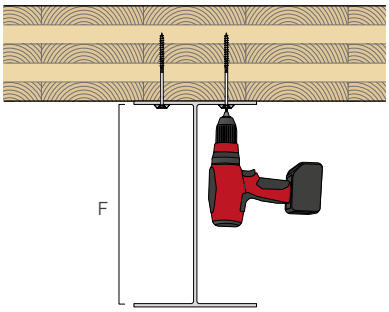
F < 200 mm

If the clearance (F) is small, the screws are installed using a long insert; both flanges must be drilled.



F = 200 ÷ 300 mm

In this F range, there are not enough long bits and not enough free space for the operator to manoeuvre. The slight inclination of the HUS 15° allows for easy fastening.

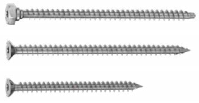


F > 300 mm

When sufficient free space is available for installation, a HUS washer can also be used, within the minimum distances.

RELATED PRODUCTS

HBS
page 30



VGS
page 164

CATCH
page 408

TORQUE LIMITER
page 408

JIG VGU
page 409